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NEW UTILITY PATENT APPLICATION TRANSMITTAL

☐ DUPLICATE

Address to:

Assistant Commissioner for Patents
Box PATENT APPLICATION
Washington, DC 20231

Attorney Docket No.:

EM/JUH/4463

First Named Inventor
(or Identifier)

JUH et al.

Total Pages:

23


This submits a new application under 37 CFR 1.53(b).

Entitled:

A BACKLIGHT SOURCE DEVICE

- ☒ 1. Submitted herewith are the following:
 9 pages of specification, including an Abstract,
 4 sheet(s) of drawings, and
 16 claim(s).
- ☒ 2. Submitted herewith is an Oath/Declaration signed by each inventor.
- ☐ 3. Submitted herewith are the following:
 ☐ signed Independent Inventor Small Entity Statement(s),
 ☐ signed Small Business Small Entity Statement(s),
 ☐ signed Non-Profit Small Entity Statement(s),
 ☐ signed Non-Inventor Small Entity Statement(s),
- ☐ 4. A preliminary amendment is enclosed.
- ☐ 5. Submitted herewith is an Information Disclosure Statement, pages of Form PTO-1449, and one copy of each document listed thereon.
- ☒ 6. An assignment of the invention to INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE.
- ☐ 7. A certified copy of application no. in .
- ☒ 8. The Commissioner is authorized to credit any over payment and charge any deficiency in any fees required under 37 CFR 1.16, 1.17 and/or 1.18, to Deposit Account No. 02-0200.
- ☒ 9. A check in the amount of \$ 800.00 is submitted herewith.
- ☐ 10. Other:

THE FILING FEE IS CALCULATED AS FOLLOWS:

				Basic Fee:	\$760.00
Total Claims:	16	-20 =	0	X \$18 =	\$0.00
Independent Claims:	1	-3 =	0	X \$78 =	\$0.00
Correspondence Address: BACON & THOMAS 625 Slaters Lane, 4 th Floor Alexandria, VA 22314-1176				Multiple Dependent Claim (add \$260.00):	
				Subtotal:	\$760.00
				50% Reduction if Small Entity Status:	
Phone: 703-683-0500 Fax: 703-683-1080				Total:	760.00
Date:	Name:		Signature:		Reg. No.
March 23, 1999	Eugene Mar				25,893

A BACKLIGHT SOURCE DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a backlight source device suitable
5 for a LCD, a display screen, a backlight plate of slice, a broadcast plate,
and other equipment necessary a backlight source device.

2. Description of the Prior Art

The light guiding plate 1 of a prior art backlight source device is
disclosed in Figs. 1 and 2. The pattern for guiding lateral light source 11
10 is a plurality of trenches arranged in parallel formed by printing, or
diffusing units formed by convex strips, or point matrix, or a plurality of
trenches arranged in parallel with equal space and equal depth for
diffusing and reflecting a lateral light source 11. The areas of all parts of
the light guiding surface 12 thereof are identical, and therefore, each part
15 has identical illumination.

However, the light from the front surface of the light guiding plate 1
of the prior art backlight source device is not often used. Since the areas
of all parts of the light guiding surface are identical, and therefore, each
part has identical illumination. In general, the central portion of the lateral

light source 11 has a illumination stronger than that of the two sides thereof. Thus, the prior art light diffusng trenches with equal depths, height and arranged in parallel will induce a non-uniform light distribution of the prior art light guiding plate 1. Namely, the portion near the central portion of the lateral light source 11 has stronger illumination, while the two sides of the lateral light source have weak illumination. Thus, "light regions" and "dark regions" are formed. This is not an ideal phenomenon.

SUMMARY OF THE INVENTION

Accordingly, the object of the present invention is to provide a backlight source device, by which the light reflected on the diffusing units by the lateral light source becomes more uniform.

Another object of the present invention is to provide a backlight source device, by which, the light regions and dark regions of a backlight source device are avoided.

A further object of the present invention is to provide a backlight source device, by which a plurality of light guiding surfaces of the backlight source device can be formed by a simplest design. Thereby,

different illuminations of emitted light are easily formed and the illumination thereof is improved greatly.

In order to achieve the aforementioned objects, a backlight source device of the present invention comprises a transparent light guiding plate; a diffusing piece on the transparent light guiding plate; a reflecting piece below the transparent light guiding plate; and a lateral light source. A plurality of diffusing units are installed on either front surface or rear surface of the transparent light guiding plate, the diffusing units have respective light guiding surfaces of different areas which are extendedly and continuously arranged.

In the present invention, the transparent light guiding plate can be formed by injecting, thermal pressing, extrusion, molding, etc. The diffusing units thereon can be formed by cutting, discharging, etching, laser cutting, etc. The diffusing unit has a convex shape or a concave shape. The lateral cross section of the diffusing unit has a V shape, a U shape, or other equivalent shape, and may be distributed with equal or unequal distance. The light guiding surfaces of the diffusing units have an equal or unequal elevations. Preferably, the elevations of different light guiding surfaces are incremented with the distance increase to the lateral

light source. The projecting area of the diffusing unit on the transparent light guiding plate is incremented with the increase of distance with the lateral light source. The thickness of the transparent light guiding plate may be identical or increased inversely proportional to the distance to the lateral light source for reducing the light energy loss or the weight and volume. The thickness of both sides of the transparent light guiding plate may be identical or increased with the distance to the middle thereof. As a consequence, when the transparent light guiding plate are finished in a specific depth, different projecting areas of the light guiding surfaces are extendedly arranged.

The light guiding surface is in parallel to said lateral light source or has an angle with the lateral light source. Even two sets of diffusing units are alternatively arranged with different angles and crossed over with each other to form a more uniform backlight effect. The areas of the light guiding surfaces increase with the distances to the middle of the light guiding plate. Thus, different areas of the light guiding surfaces are extendedly formed. The lateral light source may be a linear light source or a plurality of light sources arranged in one row.

The present invention will be better understood and its numerous

objects and advantages will become apparent to those skilled in the art by referencing to the following drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an upper view of a prior art backlight source device.

Fig. 2 is a cross sectional view along the line 2-2 of Fig. 1.

Fig. 3 is a perspective view of the embodiment of backlight source device according to the present invention.

Fig. 4 is a cross sectional view along the line 4-4 of Fig. 3.

Figs. 5 and 6 are two lateral schematic views showing two different embodiments of the backlight source devices of the present invention.

Figs. 7-12 are perspective views of several different embodiments of the backlight source devices according to the present invention.

Fig. 13 is an upper view of another embodiment of the backlight source device according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Some embodiments of the present invention are described in the following. Thereby, the present invention may be further understood.

With reference to Fig. 3 ~ 6, the backlight source device of the present invention primarily comprises a transparent light guiding plate 2, a diffusing piece 3, a reflecting piece 4 (as the dashed line shown in Fig. 4) and a lateral light source 5. A plurality of diffusing units 21 are installed on the rear surface of the transparent light guiding plate 2 (shown in Figs. 3, 5 and 6). The diffusing units 21 are spaced with an equal distance and have respective light guiding surfaces 22 of different areas (the detail is shown in Fig. 4). The diffusing piece 3 and the reflecting piece 4 are installed above and below the transparent light guiding plate 2 and the lateral light source is a linear light source. The area of each light guiding surface 22 is shown in Figs. 3 or 4, namely, the middle of the transparent light guiding plate 2 serves as base and it is enlarged toward the two sides. The larger the diffusing area, the better the light diffusing effect for compensation the weak light region on the two sides. Fig. 5 shows that the diffusing unit 21 far away from the lateral light source has a large diffusing area and has a preferred diffusing effect so as to compensate the weak light region in the farther place. The diffusing units 21 on the front or rear surfaces of the transparent light guiding plate 2 have a convex (Fig.6) or a concave (Figs. 3 and 5) shapes. The elevation of the light

guiding surface 22 is increased with the distance to the lateral light source 5.

The diffusing units 21 on the Figs. 3, 5, and 6 have a V shape lateral cross section. In Figs. 3, 5, 6, 7, 8, 9, it is appreciated that the thickness of the transparent light guiding plate 2 is increased inversely proportional to the distance to the lateral light source 5 for reducing the light energy loss or the weight and volume thereof. Figs. 10, 11, 12 show that the thickness from the front side to rear side of the transparent light guiding plate 2 is identical. Figs. 8, 9, 11, 12 show the thickness of the transparent light guiding plate 2, wherein the two transverse sides have thickness wider than that in middle.

Fig. 3 shows that the light guiding surface 22 is in parallel with the lateral light source 5. Fig. 13 shows that the light guiding surface 22 has an angle with the lateral light source. Clearly, in Fig. 13, two sets of diffusing units are alternatively arranged with different angles and crossed over with each other to form a more uniform backlight effect.

As a result, the present invention has the following advantages:

1. The illumination of reflecting light in the front surface is enhanced,
the loss is reduced and the average illumination of the backlight
source device is improved.

2. The dark and light regions of the backlight source device are
disappeared so that the backlight area is more uniform.

3. The backlight source device of the present invention is easily
fabricated.

Although the present invention has been described using specified
embodiment, the examples are meant to be illustrative and not restrictive.

It is clear that many other variations would be possible without departing
from the basic approach, demonstrated in the present invention. Therefore,
all such variations are intended to be embraced within the scope of the
invention as defined in the appended claims.

What is Claimed is:

1. A backlight source device, comprising:

a transparent light guiding plate, a plurality of diffusing units being installed on either front surface or rear surface thereof, said diffusing units having respective light guiding surfaces with different areas which are extendedly and continuously arranged;

a diffusing piece on said transparent light guiding plate;

a reflecting piece below said transparent light guiding plate; and

a lateral light source.

2. The backlight source device as claimed in claim 1, wherein said diffusing unit has a convex shape.

3. The backlight source device as claimed in claim 1, wherein said diffusing unit has a concave shape.

4. The backlight source device as claimed in claim 1, wherein said diffusing units are arranged with different distances therebetween.

5. The backlight source device as claimed in claim 1, wherein said diffusing units are formed as two diffusing unit sets which are alternatively arranged on said transparent light guiding plate.

6. The backlight source device as claimed in claim 1, wherein the lateral cross section of said diffusing unit has a V shape.

7. The backlight source device as claimed in claim 1, wherein the lateral cross section of said diffusing unit has a U shape.

8. The backlight source device as claimed in claim 1, wherein the projecting area of said diffusing unit on said transparent light guiding plate is incremented with the distance increase to said lateral light source.

9. The backlight source device as claimed in claim 1, wherein said light guiding surfaces of said diffusing units have different elevations, respectively, which are incremented with the distances increase to said lateral light source.

10. The backlight source device as claimed in claim 1, wherein said light guiding surface is in parallel to said lateral light source.

11. The backlight source device as claimed in claim 1, wherein said light guiding surface has an angle with the lateral light source.

12. The backlight source device as claimed in claim 1, wherein the projecting areas of said light guiding surfaces increase with the distances increase to the middle of the light guiding plate.

13. The backlight source device as claimed in claim 1, wherein the thickness transparent light guiding plate decreases with the distance to said lateral light source.

14. The backlight source device as claimed in claim 1, wherein the two sides of said transparent light guiding plate has thickness wider than that in middle thereof.

15. The backlight source device as claimed in claim 1, wherein the lateral light source is a linear light source.

16. The backlight source device as claimed in claim 1, wherein the lateral light source is a plurality of light sources arranged in one row.

ABSTRACT

A backlight source device comprises a transparent light guiding plate; a diffusing piece on the transparent light guiding plate; a reflecting piece below the transparent light guiding plate; and a lateral light source. A plurality of diffusing units are installed on either front surface or rear surface of the transparent light guiding plate, the diffusing units have respective light guiding surfaces with different areas which are extendedly and continuously arranged. By the present invention, the light reflected on the diffusing units by the lateral light source becomes more uniform. Thus, the light regions and dark regions of a backlight source device are avoided. The plurality of light guiding surfaces of the backlight source device can be formed by this simplest design. Thereby, different illuminations of emitted light are easily formed and the illumination thereof is improved greatly.

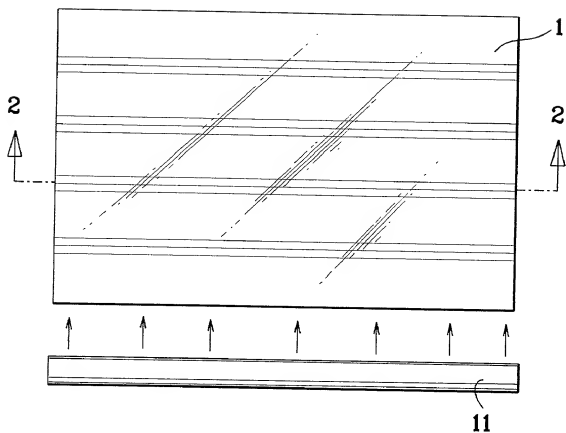


FIG.1

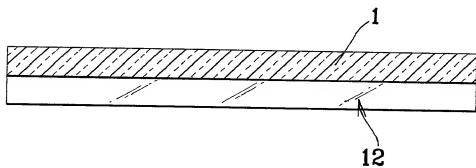


FIG.2

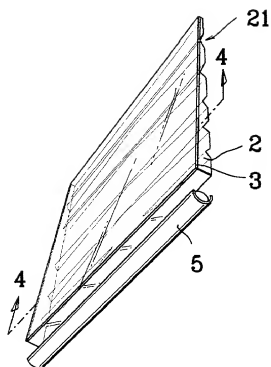


FIG. 3

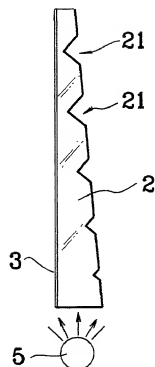


FIG. 5

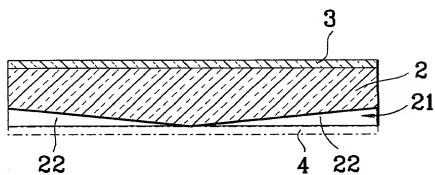


FIG. 4

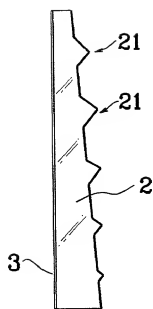


FIG. 6

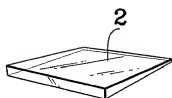


FIG. 7

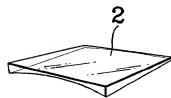


FIG. 8

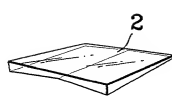


FIG. 9

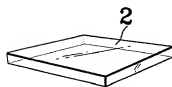


FIG. 10

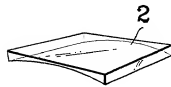


FIG. 11

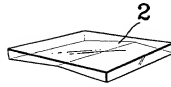


FIG. 12

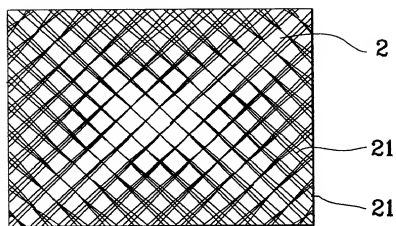


FIG.13

DECLARATION FOR PATENT APPLICATION AND APPOINTMENT OF ATTORNEY

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name; I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention (Design, if applicable) entitled:

A BACELIGHT SOURCE DEVICE

the specification of which (check one):

☒ is attached hereto.

☐ was filed on:

and (if applicable) was amended on:

☐ was filed on:

and (if applicable) was amended on:

as Application Serial No.:

as International Application (PCT) No.:

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56. I hereby claim foreign priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN APPLICATION(S)			PRIORITY CLAIMED	
Number	Country	Day/Month/Year Filed	Yes	No
88200164	Taiwan(R.O.C.)	7/1/1999	✓	

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating The United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

Application Number	Filing Date	Status - Patented, Pending or Abandoned

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: I (We) hereby appoint as my (our) attorneys, with full powers of substitution and revocation, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: J. Ernest Kenney, Reg. No. 19,179; Eugene Mar, Reg. No. 25,893; Richard E. Fichter, Reg. No. 26,382; Charles R. Wolfe, Jr., Reg. No. 28,680; Thomas J. Moore, Reg. No. 28,974; David E. Dougherty, Reg. No. 19,576; Bruce H. Troxell, Reg. No. 26,592, and Wood & Wu

I (we) authorize my(our) attorneys to accept and follow instructions from _____ regarding any matter related to the preparation, examination, grant and maintenance of this application, any continuation, continuation-in-part or divisional based thereon, and any patent resulting therefrom, until I (we) or my(our) assigns withdraw this authorization in writing.

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DATE 1999.02.09	SIGNATURE Tzeng, Gwo-Juh

DECLARATION FOR PATENT APPLICATION AND APPOINTMENT OF ATTORNEY

Page 2/2

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DATE March 10, 1999	SIGNATURE Hsu, Chao-Ching

Full Name of Joint Inventor	Citizenship
Residence Address	Post Office Address <input type="checkbox"/> Same as Residence
DATE	SIGNATURE

Full Name of Joint Inventor	Citizenship
Residence Address	Post Office Address <input type="checkbox"/> Same as Residence
DATE	SIGNATURE

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